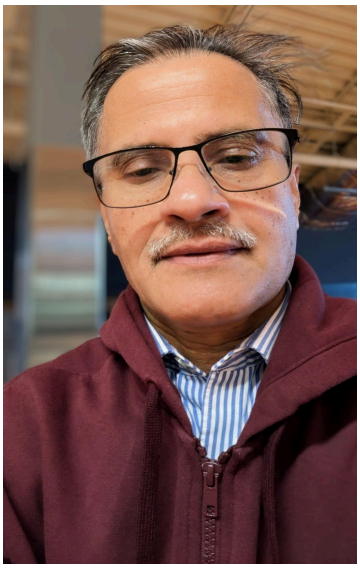
NIKOLAI IVANOVICH VAVILOV:

A Great Plant Scientist of the 20th Century

by Indrajit Roy

Toronto, Canada, September 2025

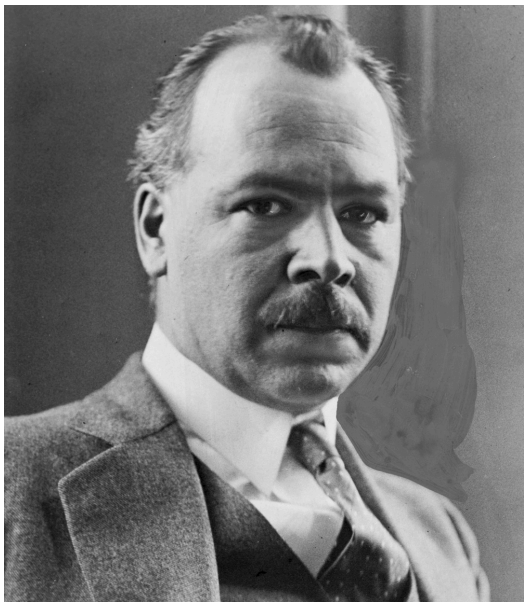
About the author



Indrajit Roy is an agricultural scientist with expertise in rural development and socio-economic empowerment. He was born in Mohanganj, Netrokona district, in 1956. He completed his secondary education from Mohanganj Pilot High School in 1972 and his higher secondary education from Government Anandamohan College, Mymensingh in 1974. In 1976, he went to the then Soviet Union for higher education on a scholarship provided by the Soviet government. He studied at the Kuban State Agrarian University in Krasnodar, now the Russian Federation. He received a Master's degree in Agricultural Science in 1982 and a Ph D in Plant Breeding and Seed Production in 1986. After returning home in 1986, he joined the Bangladesh Agricultural Research Council and worked there as the Chief Scientific Officer until March 2001. He received training on project analysis from the United States Department of Agriculture in 1992. In 1999, he did post-doctoral research at the Department of Plant Breeding at Kyushu University in Fukuoka, Japan. He has been living permanently in Toronto, Canada since 2001. He is working as an international consultant on agricultural research and rural development at various international organizations, including the Food and Agriculture Organization of the United Nations. In his personal life, he is married and has two sons.

Introduction

Nikolai Ivanovich Vavilov was a great plant scientist. His life and science career spanned both the Russian empire and the early Soviet Union. He was versatile with knowledge and expertise in a broad range of areas in agricultural science – agronomy, crop botany, plant pathology, Mendelian genetics and scientific plant breeding. He was a passionate explorer of how geography played a distinct role in shaping evolution of various cultivated plants. For this purpose, he undertook scientific expeditions to many faraway places around the world beginning in the early 1900s. Besides understanding the influence of specific geographic locations on evolution of cultivated plants, these missions had a practical purpose. Vavilov wanted to create new varieties of wheat and other crops that could produce high yields in a variety of agro-climatic conditions. He wanted to create varieties that were resistant to diseases, droughts, dry winds, frosts, and so on. He knew that the more the parent materials he would use in making crosses are diverse by their origin, the higher is the chance for finding suitable genes that would confer those traits and assembling those genes in the new variety.



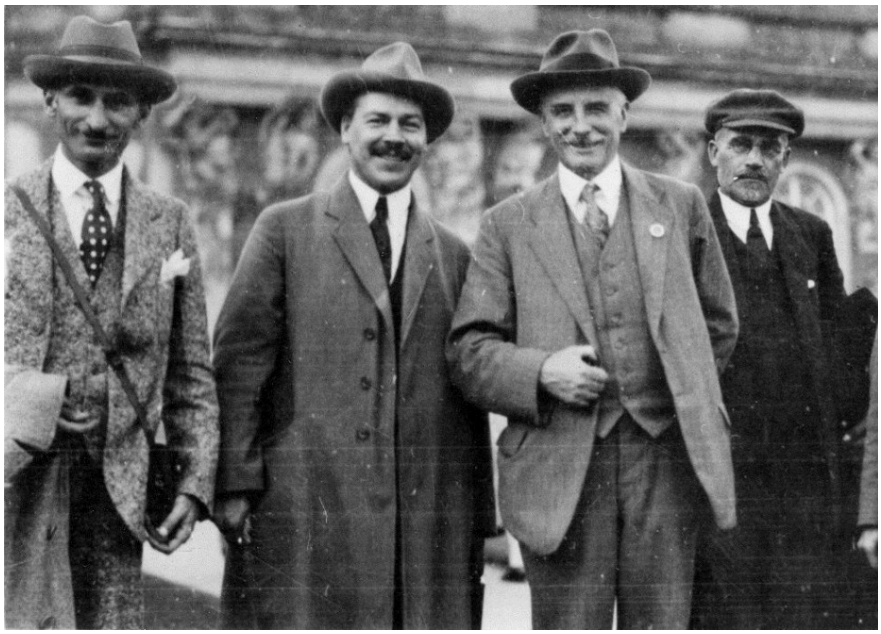
Vavilov's scientific expeditions

Between 1916 and 1933, N.I. Vavilov led over 100 plant collecting (seeds and living plant materials) missions travelling across Asia, Africa and the Americas. Among the most significant expeditions was travelling to Northern Iran and Pamir mountains in 1916. During this mission Vavilov collected samples of Persian wheat. Later in the laboratory he attempted to infect them with pathogens common in Europe, but the plants proved resistant. Vavilov understood that plant immunity directly depends on the environment in which they developed: some species are resistant to certain microorganisms, while

others remain vulnerable. During the expedition, Vavilov noticed patterns in the hereditary changes of wheat. Tracing the development of varieties from Iran to the Pamirs, he confirmed his hypothesis and identified the Pamirs as one of the birthplaces of cultivated plants. In 1921, Vavilov visited North America – United States, Canada, and Mexico – to collect plant samples. In 1924, Vavilov undertook missions to Afghanistan and India. He collected a wealth of plant specimens during this trip. This mission was followed by visits to Mediterranean and Northeast Africa (1926–1927) and East Asia (China, Japan, and Korea) in 1929. The seeds and living plant materials collected through these expeditions laid the foundation for Vavilov's world collection of plant species (мировая коллекция). These trips also helped Vavilov to pinpoint geographical hotspots of evolution of important cultivated plants.

Vavilov's theories

Based on these findings, Vavilov developed the theory of centers of origin and diversity of cultivated plants. According to this theory, cultivated plants arose and developed in relatively few geographic hotspots, located primarily in mountainous areas. He identified eight primary "Vavilov centers," which are also areas of high genetic diversity. This theory was elaborated in his major book "Centers of Origin of Cultivated Plants", which he published in 1926 and brought him world fame. In addition to the "Centres of Origin" theory, N.I. Vavilov made groundbreaking contributions to plant science through his theory of plant immunity and the law of homologous series in hereditary variation. Vavilov's work on plant immunity focused on understanding how plants resist diseases and pests. He proposed that immunity is closely linked to a plant's genetic diversity and evolutionary adaptations. By studying diverse plant species, he identified that resistance to pathogens often stems from specific genetic traits.



(In the photo, N.I. Vavilov in Berlin, Germany, 1927)

This research became the foundation for breeding disease-resistant crop varieties. The law of homologous series in hereditary variation states that closely related species and genera of plants exhibit parallel patterns of hereditary variation. In other words, similar traits and their variations appear consistently across related species. This law helped plant breeders to narrow down search for parent materials that may contain desired traits for use in their hybridization programmes. To Russian/Soviet agricultural and genetics science, N.I. Vavilov was what Dmitry Ivanovich Mendeleyev was to inorganic chemistry. In both fields, Russian scientists made foundational contributions and that was a source of enormous national pride.

When we studied in the Kuban Agricultural Institute (1976–1986), our class on crop production (растениеводство) began with introduction of Vavilov's theory of the Centres of Origin and Diversity of Cultivated Plants ("Учение о центрах происхождения и разнообразия культурных растений"). We still remember how our teacher professor Victor Grigorievich Pavlukov explained the theory showing the centres of origin on a large world map hanging on the wall. But beyond that we didn't know much about Vavilov's life, his struggles to overcome the constraint imposed by his class origin (he wasn't someone from the working class), and the persecutions he suffered at the hand of government officials cutting short his lifespan.

Vavilov's early life

Having been born in Moscow, Russian empire, in 1887 into an affluent family of an entrepreneur (his father was the director of a textile factory), Vavilov wasn't supposed to be a scientist. His father wanted him to follow in his footsteps. At father's behest, Nikolai enrolled in Moscow Business school, but he was truly fascinated by natural science from early childhood. In his father's library, he used to spend hours studying herbariums and geographical atlases, dreaming of distant lands. Upon completion of the school he was admitted in the agronomy faculty of the Moscow Agricultural Institute in 1906 (which later became Moscow K.A. Timiryazev Agricultural Academy). This institute was the premier scientific institution in imperial Russia. It was here that Russian scientist Dmitry L. Rudzinsky initiated systematic wheat breeding efforts, including hybridization, in the 1870s. His work focused on studying and crossing wheat varieties to improve traits like yield and adaptability to the Russian climate.

Nikolai Vavilov graduated from the Moscow Agricultural Institute in 1911. During 1911–1922, he worked at the Bureau of Applied Botany in St. Petersburg. He studied agricultural plants, particularly their resistance to diseases. In 1913, N. I. Vavilov went abroad for higher training (Стажировка) for two years. He worked in the largest genetic laboratories of the time in Great Britain, France, and Germany. Upon return from Europe, Vavilov set out on botanical expeditions as stated above. In 1917, he was appointed head of the Department of private sector farming and plant breeding at Saratov University. There, he began systematic research into plant genetics and breeding. The 2017 Bolshevik revolution found Vavilov in Saratov. Many scientists fled abroad at the time, and he had his chance—Europe knew him as a promising researcher. He was fluent in English, French and German languages. But he chose to

stay. He would later tell French journalists: “I do not serve the government, but Russia.” A true patriot dedicated to serving his motherland didn’t have any idea then what was in store for him.

The All-Union Institute of Crop Cultivation

In 1920, Vavilov headed the Department of Applied Botany and Breeding in Petrograd, formerly the Bureau of Applied Botany. In 1924, the Department was reorganized and upgraded into the All-Union Institute of Crop Cultivation (Всесоюзный институт растениеводства, ВИР or VIR). N.I. Vavilov became its first Director providing strategic guidance for its development. It also became the centre for holding Vavilov’s world collection of plant species. VIR is widely regarded as the world's first seed bank dedicated to the systematic collection and preservation of plant genetic resources. While earlier botanical collections existed, VIR was the first to focus specifically on preserving crop genetic resources for scientific and practical use, setting the model for modern gene bank. VIR holds a collection of 325,660 plant material samples, including seeds and living plants, representing 64 botanical families, 376 genera, and 2,169 species. This collection includes 41,000 samples of wheat collected in 97 countries.

Vavilov's strategic vision for VIR included a network of experimental stations across the Soviet Union to study and collect plant genetic resources under diverse climatic and ecological conditions. By 1924, the institute had begun establishing a system of experimental stations across the country. These stations were strategically located to cover different ecological and soil-climatic zones, from the temperate regions of European Russia to the subtropical areas of the Caucasus and Central Asia. By 1924, ten experimental stations (branches) of VIR existed.

In the photo, N.I. Vavilov at the Kuban experimental station at Krasnodar)

Some of the early experimental stations were Kuban station (Krasnodar territory) focused on grain and other crops suited to southern Russia; Maikop station (Adygea adjacent to Krasnodar) with responsibility for fruit and subtropical crops; Sukhumi station (Abkhazia, Georgia) focused on subtropical and citrus

plants; Tashkent Station (Uzbekistan) for researching adapted to Central Asian conditions; and Far East Station (Vladivostok area) with responsibility for crop plants suited to the Eastern regions. VIR started research on development of new varieties of wheat resistant to diseases and adapted to different agro-climatic conditions in various regions of the Soviet Union. In VIR, Nicolai Ivanovich Vavilov introduced an interdisciplinary approach combining botany, genetics, geography and agronomy in organizing scientific research for crop improvement. Vavilov's interdisciplinary approach to collection of crop germplasm and its utilization later evolved into the concept of using Plant Genetic Resources (PGR) for food and agriculture promoted by the UN's Food and Agriculture Organization (FAO) throughout the world.

The Lenin All-Union Academy of Agricultural Sciences

In 1929, the Soviet Government established the Lenin All-Union Academy of Agricultural Sciences. It was widely known by its Russian acronym ВАСХНИЛ (pronounced as VASKhNIL). Its purpose was to enhance the role of science in the development of agriculture and increase its productivity. Along with VASKhNIL, a large number of agricultural experimental stations were built – 1300 existed officially by 1932. The Academy became the apex scientific institution for coordinating agricultural research in the Soviet Union. In addition to his position as Director of VIR, N.I.Vavilov headed the newly created Agricultural Science Academy as its first president. An integrated institutional structure for accelerating science-based development and introduction of modern technologies in agriculture took shape in the Soviet Union at the end of the 1920s. The system was led by N.I. Vavilov. It comprised the VIR, the gene bank located in it, a network of country-wide agricultural research stations, and an apex national institution for guiding and coordinating agricultural research. After the revolution and throughout the 1920s, Vavilov enjoyed unwavering government support for his relentless endeavours to promote scientific foundations of plant genetics and its utilization in crop breeding.

However, the overall situation in the agriculture sector and along with it the priorities of the government radically changed in the early 1930s. Soviet leader Joseph Stalin announced collectivization of agriculture as one of the three pillars of his programme of construction of socialism. Officially, the policy went into effect on 5 January 1930. Collectivization put an end to Russia's peasant farming by abolishing private ownership of land and requiring farm families to amalgamate into collective farms. Collectivization wasn't something Russia's peasants agreed to voluntarily. It was done forcibly. Well-off peasants ("kulaks") and those who resisted were subjected to mass repression. Their property was confiscated, and their families were exiled to remote regions such as Siberia, Kazakhstan.

The policy of total collectivization, along with the practice of forced grain procurement caused massive disruption of the existing agricultural production system leading to food shortages. It was accompanied by back-to-back crop failures caused by the outbreak of rust diseases that devastated wheat crops in Ukraine, Southern Russia, in the Volga region and Kazakhstan. As a result famine broke out in which many people died. To rapidly increase food production, Soviet leaders wanted quicker results from the investments made in modernizing the plant breeding system under the leadership of N.I. Vavilov. But in

those days, developing new varieties through classical plant breeding typically would take 15–20 years. There was little that Vavoliv could do to shorten the variety development cycle through scientific breeding.

Vavilov's fall from the grace of authorities and the rise of T. D. Lysenko

Sensing the mood of the political leaders facing a serious food crisis, an agronomist with limited scientific education, Trophim Denisovich Lysenko, surfaced with his own pseudo-scientific ideas. He claimed his ideas and methods could improve agricultural production at a much faster pace than what Vavilov's modern genetics- based scientific plant breeding programme could offer. Born into a poor peasant family in 1898, Lysenko learned to read and write when he was about 13 years old. He finished a two-year rural school in 1913 and then enrolled in the lower school of horticulture in Poltava, Ukraine. In 1917 he enrolled in the secondary school of horticulture in Uman (now the Uman National University of Horticulture in Ukraine) which he completed in 1921. In 1922, he enrolled in the Kiev Agricultural Institute (now the National University of Life and Environmental Sciences of Ukraine) in a distance learning programme from which he graduated with a degree in agronomy in 1925.

Lysenko rejected Mendelian genetics portraying it as a tool of bourgeois science. He asserted "genes" don't exist arguing the bourgeois class invented the theory of genes to perpetuate their dominance in agriculture and suppress the peasant class. Lysenko claimed he mastered agro-techniques through years of field practice that could create new crop varieties in just 2–3 years. He claimed that by manipulating environmental conditions through vernalization or other treatments, he could rapidly "transform" plants to produce desired traits, like higher yields or adaptability to specific climates, and that these changes could be passed to subsequent generations. This was in stark contrast to conventional plant breeding, which typically required much longer periods due to the need for careful selection and cross breeding to stabilize traits in the offspring.

Trofim Lysenko published his theory of vernalization in an article titled "About vernalization of agricultural plants" published in the 7th December 1929 number of the "Pravda" newspaper. In this article, he described the method of pre-sowing treatment of seeds to hasten crop growth, presenting vernalization as a means of controlling plant growth. In reality, it was a great act of cheating. Plant physiologists knew about vernalization for long as a technique to break seed dormancy and stimulate plant growth in certain species. Vernalization involves exposing seeds or plants to a prolonged period of cold to mimic winter conditions. It triggers physiological changes that enable germination or flowering when warmer conditions return. This phenomenon has been studied for over a century, with early research dating back to the 19th and early 20th centuries, particularly in relation to winter crops like wheat and barley.

What Lysenko really did was apply a long known process of crop physiology as an agronomic field practice on a large scale which could produce limited benefits under certain conditions. It wasn't even an innovation. N.I. Vavilov initially supported T.D. Lysenko trying to co-opt him in his team. But Lysenko set his sight much higher. The article published in "Pravda" drew the attention of the Soviet leader Joseph

Stalin. Stalin bought into Lysenko's theory because it promised quicker solutions of problems facing agriculture and food production. It perfectly matched the political and economic priorities of the Soviet Government in that period. Following the publication of this article, Lysenko got support from the Soviet authorities which helped him to rise as a scientist capable of making meaningful differences to Soviet agriculture. With a solid support base rallied behind him, Lysenko decided to launch a "scientific class war" upon N.I. Vavilov. In this war, Vavilov was seriously disadvantaged.

As we have indicated at the beginning, he was born into a wealthy merchant family and had a privileged upbringing. It was thus easy for Lysenko to portray Vavilov as a representative of the bourgeois class, a class enemy not fit to work in the interests of the proletariat (which also included peasants). Vavilov had an impressive academic background and scientific credentials. He studied at the renowned institutions of higher education in the Russian empire/Soviet Union, did post-graduate research in prestigious universities in UK, France, and Germany. He cultivated professional links with Western scientists and scientific research institutions. At the beginning of his career, Vavilov made discoveries and significant original contributions to plant science. In a race to occupy the top leadership position to handle development of agricultural research, N.I. Vavilov was seemingly unassailable particularly compared with Lysenko's academic and professional background.

But the Bolshevik Government led by Joseph Stalin had different standards and calculations in candidate selection for top positions. By those standards, Lysenko easily surpassed Vavilov. Lysenko rose from a poor peasant family making his way through enormous hardship. What he learned in agriculture was mostly through field practice and working closely with peasants. With a working class background Lysenko had unquestionable loyalty to the Bolshevist Party. He was a trustworthy comrade ready to give what the Soviet authorities wanted to solve urgent issues in food production no matter through scientific or pseudo-scientific methods. In short, politics became deeply enmeshed with science in deciding priorities for plant genetics and agricultural research in the Soviet Union in the 1930s.

Lysenko's rise to the top became irreversible following the Second All-Union Congress of Collective Farm - shock Workers (Второй Всероссийский съезд колхозников-ударников). It was held from February 11–17, 1935, in the Kremlin Palace of Congresses. The event was attended by approximately 1,500 delegates, members of the Bolshevist Party Politburo (including Stalin, Molotov, Voroshilov, Kaganovich, Kalinin), and foreign guests.

The timing of holding this Congress was very important for the Bolshevist party because it celebrated the completion of transformation of agriculture and drastic change in the rural way of life. It was in line with Stalin's programme of socialist construction. By 1935, collectivization had largely been consolidated which saw its most intense and chaotic phase during 1929–1932. The process had fundamentally transformed Soviet agriculture from individual peasant farming to a system dominated by collective farms (kolkhozes) and state farms (sovkhozes). By 1935, collectivization was nearly complete in terms of scale. Approximately 70–75% of peasant households were part of collective farms, and over 90% of arable land was under collective or state control.

This marked a significant shift from the pre-1928 structure, in which most agriculture was based on small, private plots. After the peak of forced collectivization (1932-1933) passed, the Soviet government began stabilizing the collective farm system. In 1933–1935, policies were adjusted to address some of the chaos and resistance, for example, peasants were allowed small private plots (up to 0.5 hectares) for personal use, which helped supplement food supplies and reduce unrest, and the state reduced grain requisition quotas slightly to stabilize agricultural output after the famine-induced disruptions. The focus shifted to improving efficiency and enforcing discipline within kolkhozes. The Party's main priority during this period was to portray collectivization of agriculture as a great policy success. The key task for agricultural research was to rapidly improve agricultural yields in the changed context in rural areas where collective farms were the key institutions. It was also very important for the party to sustain a campaign mode in support of collectivized agriculture. In this context, Lysenko proved an ideal fit, while N. I. Vavilov—an eminent agricultural scientist committed to scientific rigor—stood increasingly out of place. What followed was a looming confrontation between political opportunism and professional integrity.

Trofim Lysenko delivered a long fiery speech at the Congress in presence of Soviet leader Joseph Stalin on 13 February 1935. The topic of his speech was "Vernalization - a powerful means of increasing crop yields."

At that time, Lysenko was a member of the All-Ukrainian Academy of Sciences, scientific director of the Institute of Plant Breeding of the Academy of Sciences of Ukraine in Odessa. Below is a concise text of his speech. In his speech, he consciously targeted N.I.Vavilov and his followers of genetics science, and evidence-based plant breeding. He cleverly portrayed them as class enemies. Lyseno began his speech by addressing the audience as Comrades, the best shock workers of the socialist fields! (Товарищи ударники социалистических полей!)

“Our science is fundamentally different from bourgeois science in both its objectives and its content. To substantiate this comparison, I'll give a few examples from the vernalization work I'm leading. By the way, vernalization, as a branch of science, was discovered and developed exclusively by Soviet science.

We are currently facing the pressing issue of breeding and cultivar development. For many regions, we still lack the necessary winter and spring wheat varieties. Every winter, the best collective farmers in these areas fear: what if the wheat freezes during the winter? What if a dry wind destroys the harvest just as the grain is ripening? Breeding is based on a science called genetics. This is the study of how parents pass on their traits and characteristics to their offspring. Science is extremely important because we need to know how, by crossing and combining this kind of wheat with that kind of wheat, we can obtain a third, better variety. But when you ask many geneticists how they study the hereditary basis of parents, the answer you hear is: we study the hereditary basis from the descendants; we must first look at what the offspring will be like, and then talk about the parents.

This answer cannot satisfy us. In many cases, we can already know, even before crossing, which two unsuitable or inferior wheat varieties, when crossed, will yield the variety we need for a given region. And it's not that difficult. Academician Vavilov collected 28,000 varieties of wheat from all over the world. Academician Vavilov accomplished a tremendous and valuable feat. This valuable collection now resides in our Union. It is clear that for our conditions the vast majority of these varieties, when used directly on collective farms, are unsuitable. When we sow them, for example, in Odessa or in another region of the European part of our Union, it turns out that with autumn sowing these varieties almost completely freeze, and with spring sowing many of these varieties do not bear spikes, they are winter-type.And spike emergence of many varieties is delayed. It's clear that these varieties won't produce a harvest.

Comrades, wasn't there and isn't there a class struggle on the vernalization front? On the collective farms, there were kulaks and their associates, who often whispered to the peasants, and not only they, but all sorts of class enemies whispered to the peasants: "Don't wet the grain. It will cause the seeds to die." There were such cases, such slanders, such kulak, treacherous tales, when instead of helping the collective farmers, they committed sabotage. Both in the academic world and outside it, a class enemy is always an enemy, whether they are academic or not

Next comes the question of selection. Until collective farmers get involved in the selection process, until they get involved, things will go wrong. Many scientists have said that collective farmers aren't drawn into genetics and breeding because it's so complex and requires a college degree. But that's not true. The issues of selection and genetics based on the theory of plant development (vernalization theory),

which was developed by Soviet science in collective farm fields, are now posed differently. Now, like bread, like water for the thirsty, it is necessary for the masses of collective farmers to intervene in the work of selection and genetics. Collective farm initiative is essential in this matter; without it, we will only have scientific specialists-breeders and lone artisans.

Vavilov's arrest and prosecution

In the summer of 1939, Trofim Lysenko's supporter Isaac Present wrote a memo to the head of the USSR government, Vyacheslav Molotov, which stated:"Vavilov and his followers have completely lost their cool, and one cannot help but conclude that they will try to use the International Genetics Congress to strengthen their status and position. At present, preparations for participation in the congress are entirely in Vavilov's hands, and this can in no way be tolerated any longer. Judging by the aggressiveness with which Vavilov and his associates speak out, the possibility of a kind of political demonstration "in defense of science" against its "oppression" in the Soviet Union cannot be ruled out. The Congress can become a means of fighting against the turn of our Soviet science towards practice, towards the needs of socialist production, a means of fighting against advanced science." It is believed that this report, written with the knowledge of Trofim Lysenko, became the trigger for initiating the case against Vavilov. But the scientist's arrest occurred only in August 1940, at a time when Vavilov was on another field trip to Western Ukraine.

Vavilov's investigative file contains documents that reveal the background of how the arrest was plotted. On 18 July 1940, the USSR People's Commissar for Agriculture (Agriculture Minister), Ivan Benediktov, signed an office order endorsing Vavilov's plant collecting trip to Western Ukraine. Immediately after the scientist's departure from Leningrad, on 22 July 1940, USSR People's Commissar of Internal Affairs (Home Minister) Lavrenty Beria sent a letter to Chairman of the Council of People's Commissars (Prime Minister) Vyacheslav Molotov requesting authorization for the scientist's arrest. Joseph Stalin's signature was not on the file. A week earlier, on the 16th, Beria wrote to Molotov that "Vavilov and the bourgeois school of so-called 'formal genetics' that he led organized a systematic campaign with the aim of discrediting Lysenko as a scientist." Meanwhile, the expedition led by Vavilov moved from Lvov to Chernivtsi. The participants collected seed samples from the ripening fields along the way, visited the surrounding farms, and held meetings with botanists and agronomists.

On 6 August 1940, Vavilov and a group of local scientists and agronomists were planning a trip from Chernivtsi to the mountainous region of Putivl in three cars. The distance to the Carpathian Heights was approximately 150 kilometers. The weather was sunny, and the expedition members and hosts were in high spirits. However, very soon, while still in the foothills, one of the cars, in which the Vavilov's student and like-minded person, Vadim Lekhnovich, was riding, suffered several punctures, fell behind, and turned back. On the way back, we encountered a black Emka just like ours," he later recounted. "The oncoming traffic stopped us. Four men started asking us where Academician Vavilov was." We explained the route the other two cars had taken. We asked why they needed Nikolai Ivanovich. "He'd brought some grain export documents from Moscow," came the reply. "We really need those documents." The black Emka continued on to look for Nikolai Ivanovich, and we returned to Chernivtsi. Later they came to

know about the arrest of Vavilov. On 10 August 1940, arrested Vavilov was transported by train via Kiev to Moscow, to Lubyanka, the famous (notorious) headquarters of the NKVD (subsequently KGB) for interrogation.

On 12 August 16, 1940, a junior officer from the investigative department of the NKVD (народный комиссариат внутренних дел, Russian acronym for the home ministry) charged Nikolai Vavilov with four counts of Article 58, which stipulates the death penalty. At that time, Vavilov was on a field trip to Western Ukraine, near the city of Chernivtsi. On 10 August 1940, arrested Vavilov was transported by train via Kiev to Moscow, to Lubyanka, the famous (notorious) headquarters of the NKVD (subsequently KGB) for interrogation. The decision to bring charges noted that the arrested Vavilov "is sufficiently exposed for the fact that for a number of years he was the leader of a counter-revolutionary organization, rallying the counter-revolutionary-minded part of the intelligentsia to fight against the Soviet government. As an agent of foreign intelligence agencies, he was actively engaged in espionage, sabotage, and subversion to undermine the economic and defense capabilities of the USSR. He advocated the restoration of capitalism and the defeat of the USSR in the war with the capitalist countries. During lengthy and grueling interrogations, Vavilov agreed with the charges brought against him. After 11 months of investigation, on 9 July 1941, the Military Collegium of the Supreme Court of the USSR sentenced Nikolai Ivanovich Vavilov to death.

The sentence, however, was not carried out. In October 1941, as the invading German army approached Moscow, Vavilov was transferred to a prison in Saratov. From there, he wrote a letter to Lavrentiy Beria, the head of the NKVD, in which he denied the accusations of espionage and asked for a mitigation of the sentence, allowing him to work in his specialty. In June 1942, the deputy head of the NKVD, Vsevolod Merkulov, sent a statement to Vasily Ulrikh, chairman of the Military Collegium of the Supreme Court of the USSR, in which he petitioned to replace Vavilov's death sentence with imprisonment in the NKVD's corrective labor camps for 20 years, so that he could be used for work of "defense significance." A few days later, the commutation of the sentence was approved. But Vavilov never lived to see his release. The 55-year-old scientist died in a Saratov prison on 26 January 1943 from exhaustion, malnutrition and the consequences of previous illnesses.

Conclusion

The relentless class war that a pseudo-scientist, from a poor working class background, Trofim Lysenko, launched against a globally renowned scientist N.I. Vavilov in 1935 enjoying state support finally brought to an end one of the most brilliant minds of Soviet agricultural science and plant genetics. It was an enormous human tragedy, a great loss to the Soviet as well as world science. For three decades from 1935 to 1965, when Lysenko was removed from all positions he held and Lysenkoism was officially declared as pseudo-science, Soviet genetics science went through a period of decline. It was reflected in limited gains from plant breeding and slower growth of agricultural productivity. Plant breeders who followed Vavilov's science-based principles for crop variety development had to focus solely on hybridization, selection, and field testing with minimum reliance on lab equipment. They had consciously

avoided any reference to “genes” or “genetics”. Lysenko inflicted immense damage to Soviet agricultural science. During 1935–1965, maize production in the US was revolutionized through using the genetic principle of heterosis. DNA was discovered in 1953. Research on developing DNA-based molecular approaches to plant breeding geared up. Soviet scientists didn’t have the ability and needed institutional capacity to play any meaningful role in all of these developments.

Trofim Lysenko might have won the class war but the gains didn’t last long. Fate wasn’t kind to the varieties that he developed and the projects that he conceived for plant transformation. Wheat treated through vernalization or transformation often rotted, died, or produced negligible harvests due to unproven techniques and bans on using fertilizers/pesticides. Close planting led to competition and disease; "transformed" wheats failed to inherit changes, reverting after one generation. Lysenko famously asserted that wheat could be "transformed" into rye or other grains through repeated environmental exposure, such as planting spring wheat in autumn conditions for 2–4 years. He cited examples like Triticum durum (tetraploid spring wheat) becoming Triticum vulgare (hexaploid winter wheat), claiming chromosome numbers adjusted accordingly. By 1949, he reported "indisputable evidence" of wheat ears producing rye grains under mountainous conditions. These claims were biologically impossible due to incompatible genetics and were never replicated. Reported "successes" were contamination or fraud; crops failed.

The "varieties" were never viable or registered as stable breeds; they faded with Lysenko's fall. No modern wheat cultivars trace to his work. Some experimental stations persisted into the 1970s, but by Lysenko's death in 1976, they were obsolete. After Stalin’s death, N. I. Vavilov was officially rehabilitated in 1955 when Nikita Khrushchev came to power. The legacy that Vavilov left behind served as the cornerstone for rejuvenation and rapid modernization of the agricultural research system in the late Soviet Union and post-Soviet Russia, but Lysenko is forgotten. VIR, the world famous institution that Vavilov established is now named “N.I. Vavilov All-Russian Institute of Plant Genetics Resources,